Empirical Formulae

To find out the empirical formula for a compound you must find the amount of each element and then calculate the simplest whole number ratio of the amounts. Look at the example below.

A compound is 75% carbon and 25% hydrogen. What is its empirical formula?

Assume sample weighs 100g ☞

This'll turn it into an easy ratio for the formula. ☞

Elements	Carbon	Hydrogen
% Element	= 75	= 25
Mass (g)	= 75	= 25
Divide by A_r for each element	= $\frac{75}{12} = 6.25$	= $\frac{25}{1} = 25$
$\frac{\text{Amount}}{\text{Smallest amount}}$	= $\frac{6.25}{6.25}$	= $\frac{25}{6.25}$
Ratio of amount	= 1	: 4

C_1H_4 or, better, CH_4

Answer these two-element questions:

Q1 A hydrocarbon is 80% carbon and 20% hydrogen. Find its empirical formula.

Q2 A compound was found to have 82% nitrogen and 18% hydrogen. Find its empirical formula.

Q3 An oxide of carbon was found to be 27% carbon. Find its empirical formula.

Q4 An oxide of sulphur was found to be 40% sulphur. Find its empirical formula.

Q5 Fluorspar is composed of calcium and fluorine. If 51% is calcium, calculate the empirical formula.

Q6 Magnetite is an oxide ore of iron. If 72% is iron, what is its empirical formula?

And these three-element questions:

Q7 Cryolite is an ore of aluminium used in the extraction of aluminium from bauxite; it was found to have 33% sodium, 13% aluminium and 54% fluorine. Work out the empirical formula.

Q8 Nitram is an ammonium fertiliser; it is 35% nitrogen, 5% hydrogen and 60% oxygen. Calculate its empirical formula.

Q9 Saltpetre is a potassium salt; it is 13.9% nitrogen, 38.6% potassium and 47.5% oxygen. Work out its empirical formula.

Q10 Caustic soda is a strong alkali containing sodium. It is 40.0% oxygen, 57.5% sodium and 2.5% hydrogen. Calculate its empirical formula.